220099

FLOOD INSURANCE STUDY

TOWN OF LAKE ARTHUR, LOUISIANA
JEFFERSON DAVIS PARISH

OCTOBER 15, 1980

federal emergency management agency
federal insurance administration

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Lake Arthur, Jefferson Davis Parish, Louisiana, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of the information will be to convert the Town of Lake Arthur to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Basic data for the study were collected from various sources, including pertinent studies and reports prepared by the New Orleans District, US Army Corps of Engineers (COE). FIA and US Geological Survey (USGS) maps were utilized to develop the base map and work maps used for this study.

A coordination meeting was held in the Town of Lake Arthur in December 1977 to discuss the study and to exchange pertinent information. Representatives of the community, the FIA, and the COE were in attendance.

A copy of the review draft was sent to the state coordinator for his review and comments. On June 5, 1980, the results of the study were reviewed at a final coordination meeting attended by representatives of the COE, FIA, and the Town of Lake Arthur.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the New Orleans District, US Army Corps of Engineers, for the Federal Insurance Administration under Interagency Agreement No. IAA-H-18-78, Project Order No. 46. This work, which was completed in January 1980, covered all significant flooding sources in the Town of Lake Arthur.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Lake Arthur. The area of study is shown on the Vicinity Map (Figure 1).

It was determined that significant potential flood hazards exist from backwater flooding produced by high stages on Lake Arthur associated with headwater flood or hurricanes from the Gulf of Mexico and that these sources of flooding would be studied in detail.

2.2 Community Description

The Town of Lake Arthur lies in the extreme southeast portion of Jefferson Davis Parish which is near the southwestern corner of Louisiana. Its population in 1970 was 3,551, an increase of 10 from the 1960 census. The economy of the area is based on rice, soybean, and beef production and industries related to onshore and offshore oil production.

The Mermentau River (Lake Arthur) flows through the southern portion of Lake Arthur and forms the southern boundary of the corporate limits. The Mermentau River, some 72 miles long, empties into the Gulf of Mexico, some 50 miles downstream from the Town of Lake Arthur.

The Town of Lake Arthur is served by Louisiana Highways 14, 26, and 380. Rail transportation needs are met by the Southern Pacific Railroad. The navigable Lake Arthur serves as a connecting link to the Gulf of Mexico and the Gulf Intracoastal Waterway system which extends from Florida to the Mexican border.

The climate in the vicinity of the Town of Lake Arthur is characterized by tropical summers, when temperatures might rise above 90 degrees F, moderately cool winters, when temperatures fall below 50 degrees F, and an annual average temperature of 68 degrees F. Annual precipitation totals 57 inches on the average with slightly more falling in the summer and fall months.

The terrain in the Town of Lake Arthur is identified as Prairie Coastwise Terrace with elevations ranging from 0 at the waters edge to 15 feet above National Geodetic Vertical Datum of 1929 (NGVD). Development is located in those areas where the elevation ranges between 5 and 15 feet NGVD.

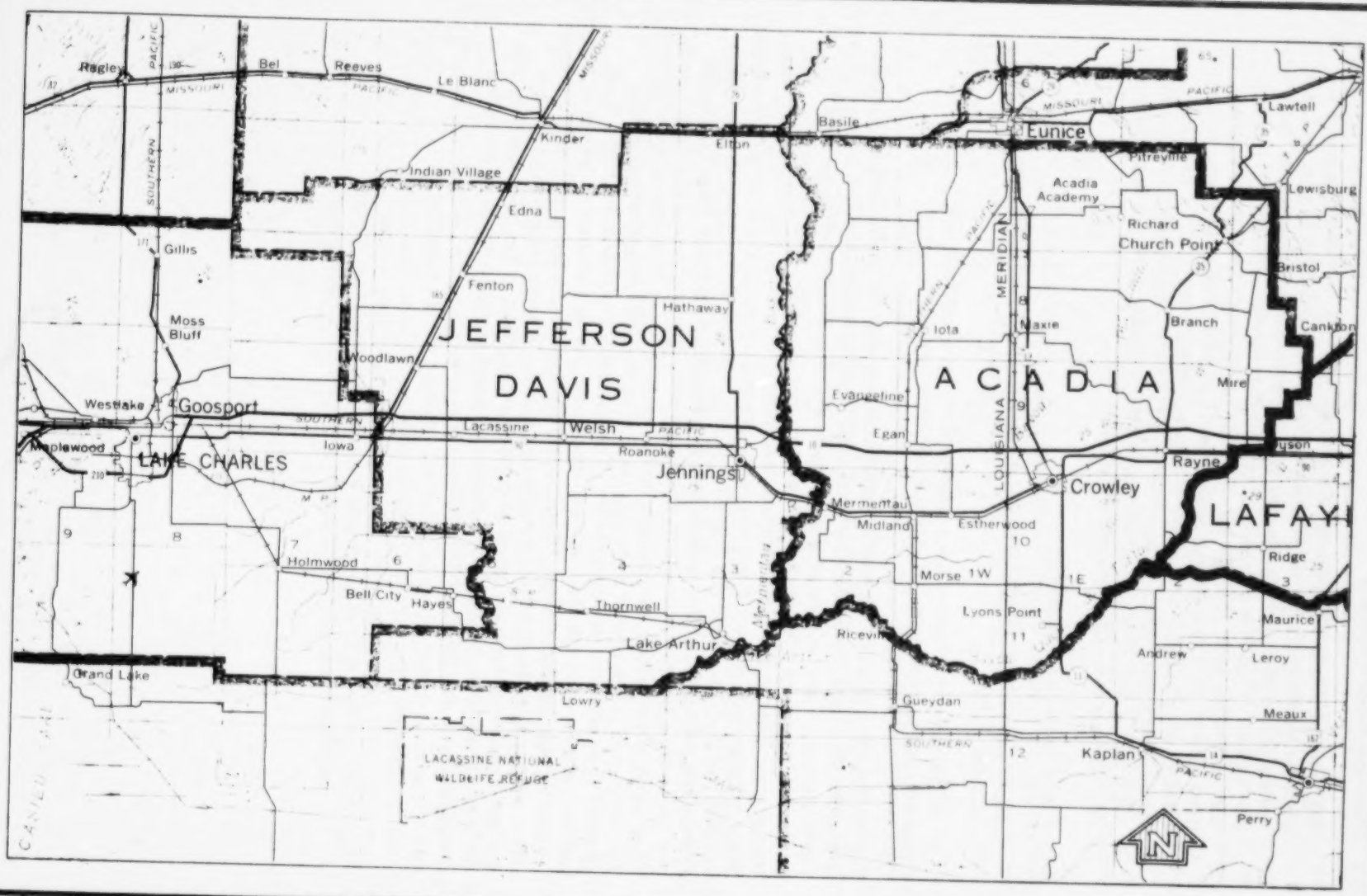

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF LAKE ARTHUR, LA
(JEFFERSON DAVIS PARISH)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

2.3 Principal Flood Problems

The relatively low-lying areas of the Town of Lake Arthur are subject to periodic flooding caused by backwater resulting from high stages on Lake Arthur associated with headwater floods which occurs normally in the winter and spring. Flooding may also occur during the summer and fall months due to intense local thunder showers and hurricanes. The greatest flood of record in the Lake Arthur area occurred in December 1971 due to heavy rainfall which produced a stage of 6.6 feet NGVD in the Lake Arthur. Other floods are known to have occurred in 1957 (Hurricane Audry), 1967, 1969, 1973, and 1974. Frequencies for these floods were not determined and damage estimates are not available.

2.4 Flood Protection Measures

There are no federal projects which provide flood protection for the Town of Lake Arthur.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to determine the maximum stages expected on Lake Arthur for the selected recurrence intervals through the development of stage-frequency curves at gaging station locations upstream and downstream of Lake Arthur, Louisiana, at Louisiana Highway 14 and Lacassine Wildlife Refuge. By interpolation between these curves a stage-frequency curve for the Mermentau River at Lake Arthur, Louisiana, was constructed. The Median Plotting Position Method used to develop the stage-frequency curves is outlined in Statistical Methods in Hydrology by Leo R. Beard (Reference 1). The highest annual stages used in the development of these curves were obtained from "Stages and Discharges," in the New Orleans District, COE, a publication which is printed yearly (Reference 2).

Further analyses were performed to establish peak discharge-frequency relationships for the flood recurrence intervals for those areas not directly affected by Lake Arthur.

The hydrology for the drainage area in the northeast section of the city northeast of the Southern Pacific Railroad, consisted of estimating surface runoff magnitudes based on regionalized rainfall data (Reference 3), computing rainfall excess, and applying the excess to a unit hydrograph to determine flood hydrographs at the railroad bridge. The resultant peak discharges are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
DRAINAGE CANAL At Southern Pacific Railroad Bridge	245	1,070	1,290	1,350	1,620

The Weather Bureau's Technical Paper No. 40 was used to obtain rainfall quantities (Reference 4). Point rainfall depths obtained from TP-40 for rainfall durations of 1/2, 1, 2, 3, 6, 12, and 24 hours with return intervals of 10-, 50-, and 100-years were plotted on logarithmic probability paper and extrapolated to estimate rainfall amounts expected to occur for a 500-year return period. The basin characteristics such as the size of the drainage area, mean basin length, lag time, etc., were determined from a topographic map of Lake Arthur developed from field surveys. The synthetic unit hydrographs were developed by the method described in Unit Hydrograph Computations by use of "K" Values (Reference 5).

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the studied in detail in the Town of Lake Arthur were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flooding sources.

Cross sectional data was obtained from field surveys and available topographic maps. Included in the hydraulic analysis was the effects of the Southern Pacific Railroad Bridge, which disects the community, on the water-surface elevations for the frequencies studied.

Water-surface elevations for the floods were computed by routing the discharge hydrographs through the railroad bridge to a tailwater condition caused by backwater from Lake Arthur. The hydraulic equations used in the routings are the same as used in the HEC-2 computer model, which are presented in the users manual (Reference 6).

All elevations used in this study are referenced to NGVD; the elevation reference marks used in this study are shown and described on the maps.

The frequency-elevation relationships for the Ponding Areas in the community are presented in Table 2, "Summary of Elevations".

TABLE 2 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION ABOVE NGVD (feet)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
LAKE ARTHUR				
Southwest of Southern Pacific Railroad and entire shoreline	5.6	6.9	7.4	8.4
Northeast of Southern Pacific Railroad *	6.7	7.7	8.3	8.8

*Flooding includeds overland flow through drainage canal

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is used to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the flood elevations at each cross section; between cross sections, the boundaries were interpolated using the flood elevations determined at each location. A topographic map at a scale of 1:24,000 with a contour interval of five feet (Reference 7). In cases where the 100-year and the 500-year boundaries are close together, only the 100-year boundary has been shown.

Small areas within the flood boundaries may lie above the flood elevations, and therefore, not be subject to flooding. Owing to limitations of the map scale, such areas arenot shown.

4.2 Floodways

The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights.

The concept of a floodway is not applicable in the Town of Lake Arthur because the flooding in the town is primarily dependent upon backwater from the Mermentau River (Lake Arthur) rather than from local headwater effects on streams within the community itself. Consequently the floodway concept would not be beneficial to the Lake Arthur community.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting the Town of Lake Arthur.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet

Two reaches meeting the above criteria were required for the flooding sources in the Town of Lake Arthur. Reach 1 extends from Lake Arthur to the downstream side of the Southern Pacific Railroad tracks. Reach 2 is located in the northeast side of the town upstream from the railroad tracks.

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Lake Arthur was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zones A3, A4: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs .

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Lake Arthur is, for insurance purposes, the principal result of the Flood Insurance Study. This map (Exhibit 1) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

The New Orleans District COE has completed several reports which resulted in a Federally authorized navigation project on the Mermentau River. The project was authorized in 1892, modified in 1935 and 1965, and provides for a 12-by 200-foot channel in the Lake Arthur and for the replacement of the old Lake Arthur Highway bridge. These improvements were implemented to enhance commercial traffic on the Mermentau River. The navigation project will have no effect on the hydrologic and hydraulic data in this report and is compatible with hydrology prepared in past reports.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Lake Arthur Reach 1 (Southwest of Southern Pacific Railroad and entire shoreline)	0001	-1.8	-0.5	+1.0	020	A4	7.0
Reach 2* (Northeast of Southern Pacific Railroad)	0001	-1.6	-0.6	+0.5	015	A3	8.0

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

*Flooding includes overland flow through drainage canal.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF LAKE ARTHUR, LA
(JEFFERSON DAVIS PARISH)

FLOOD INSURANCE ZONE DATA

LAKE ARTHUR

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Office of the Federal Emergency Management Agency, Insurance and Mitigation Division, Federal Center, Denton, Texas 76201.

8.0 BIBLIOGRAPHY AND REFERENCES

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